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SUSTAINING SOLDIER HEALTH AND PERFORMANCE IN  
THE FORMER REPUBLIC OF YUGOSLAVIA:  
GUIDANCE FOR SMALL UNIT LEADERS



U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND  
FORT DETRICK, MARYLAND 21702-5012

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USARIEM Technical Note 93-6

# *SUSTAINING SOLDIER HEALTH AND PERFORMANCE IN THE FORMER REPUBLIC OF YUGOSLAVIA:*

## *GUIDANCE FOR SMALL UNIT LEADERS*

Prepared by the Staff of the

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June 1993

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND  
FORT DETRICK, FREDERICK, MD 21702-5012

# SUSTAINING SOLDIER HEALTH AND PERFORMANCE IN THE FORMER REPUBLIC OF YUGOSLAVIA: GUIDANCE FOR SMALL UNIT LEADERS

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## **SUSTAINING SOLDIER HEALTH AND PERFORMANCE IN THE FORMER REPUBLIC OF YUGOSLAVIA**

### **FOREWORD**

Soldiers, sailors and airmen who deploy to the Former Republic of Yugoslavia (FRY) will confront an uncertain situation with great human tragedy and suffering. In addition to dealing with all of the stresses associated with deployment, they may be required to conduct peace-making or peace-keeping operations to reduce armed conflict and human suffering.

Members of the U.S. Army Medical Research and Development Command (USAMRDC) prepared this handbook of preventive medicine and behavioral guidance, as a reference for unit commanders and NCOs deploying to the FRY. It includes suggestions for sustainment of health and performance through predeployment, deployment, conduct of operations, and redeployment. It addresses a broad range of important health issues including: avoiding disease hazards, environmental exposure, managing work-rest cycles, and maintaining soldier morale in the face of destruction and human suffering.

This guidance draws heavily upon knowledge and experience gained by USAMRDC medical researchers over the past fifty years. Physicians, scientists and technicians obtained this knowledge from laboratory research and during field observations of troops deployed around the world in training, peace-keeping and combat operations.



This document is not intended to replace policy or doctrine established by Headquarters, Department of the Army; the Training and Doctrine Command; Forces Command; Special Operations Command; U.S. Army Europe; or contained in other official publications. Rather it is intended as supplementary information, making this Command's "lessons learned" available to unit commanders.

We encourage users to provide critical comments and examples of their own "lessons learned" during peace-making and peace-keeping operations to:

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## KEY POINTS

### A. MOST IMPORTANT HEALTH HAZARDS TO SOLDIERS DEPLOYING TO FRY

<u>HAZARD</u>	<u>RESULT</u>
VIOLENCE/COMBAT	UNPREDICTABLE CASUALTIES
ACCIDENTS/NON-BATTLE INJURIES	MAJOR SOURCE OF LOST MANPOWER
FOOD & WATER CONTAMINATION	SPREAD OF DIARRHEA & DISEASES
CLIMATE & TERRAIN	COLD & HEAT ILLNESS, TRAUMA
TICKS & BITING INSECTS	TRANSMISSION OF SERIOUS DISEASES
AIR & WATER POLLUTION	RESPIRATORY DISEASE, ALLERGIES & TOXIC EFFECTS

## **B. KEY PREVENTIVE MEDICINE MEASURES**

### **PREDEPLOYMENT PHASE**

- Get Required Immunizations (Recommended List, Pages 16 and 17).
- Review SOP for field sanitation, water treatment & sleep discipline.
- Review SOP for cold, heat, work-rest cycles, water discipline and buddy-aid/first-aid.
- Pack cold weather gear.
- Pack individual skin & eye protection (insect repellant, sunglasses, sunscreen, lip balm).
- Provide education on Slavic culture and current situation.
- Bring two pair of prescription eye glasses.
- Pack 6-month supply of prescription medication.
- Pack 6-month supply of personnel hygiene products (for women).
- Establish "buddy" system for physical and psychological support.
- Maintain physical fitness.

### **DEPLOYMENT PHASE:**

- Emphasize safety (injuries very common during early phases).
- Minimize sleep loss and jet lag.
- Drink plenty of fluids.
- Schedule and eat regular meals.
- Avoid alcohol, caffeine, nicotine, and carbonated beverages.

#### **OPERATIONAL PHASE:**

- Assume all water, beverages and food from non-U.S. military sources are contaminated.
- Enforce appropriate cold, heat and water discipline SOPs.
- Schedule and eat regular meals.
- Enforce sleep discipline.
- Bathe or shower daily if possible.
- Defecate only in constructed latrines or designated areas.
- Enforce use of DEET and Permethrin insect repellent.
- Avoid contact with wild and domestic animals.
- Keep soldiers informed and updated.
- Schedule regular recreation and stress alleviation debriefings.
- Emphasize safety at all times.

#### **REDEPLOYMENT PHASE:**

- Prepare for reunion with family.
- Provide stress reduction debriefings.
- Report any illness to medical professionals.

## **SUSTAINING SOLDIER HEALTH AND PERFORMANCE IN THE FORMER REPUBLIC OF YUGOSLAVIA**

### **INTRODUCTION**

The Former Republic of Yugoslavia (FRY) has been recently divided by factional and religious differences which have existed for hundreds of years. Over four million people have been displaced by the ongoing civil war. The conflict and turmoil have disrupted treatment, sanitation, and basic public health systems. Diseases have greatly increased in areas affected by the fighting, *despite relief efforts by the United Nations and other organizations*. It is likely that U.S. military personnel will be exposed to these diseases. Added to this, personnel deploying to the FRY face a potentially harsh physical environment without many of the amenities found in garrison. Harsh physical environments include mountainous terrain, extremes of heat and cold, and industrial and agricultural pollution. Furthermore, soldiers may experience psychological stress created by operating in an environment, where it is difficult to identify friend or foe.

Some familiarity with the geopolitical situation in the FRY is helpful to understand the current conflict. The FRY is a 250,000 square kilometer land mass extending from the Adriatic Sea on the West, to borders with Italy, Austria, and Hungary on the North; Romania and Bulgaria on the East; and Greece and Albania on the South. This region has undergone periods of domination by different empires primarily from the North (Austria) and the Southeast (Turkey). As a result the population of the FRY, which consists of 24 million, mainly South Slav people, has evolved into several distinct linguistic, cultural and religious groups. There are also

populations of Albanians and Hungarians. The main religious groups include Roman Catholic (Croats and Slovenes), Eastern Orthodox (Serbs) and Muslim.

From World War II until recently, religious, ethnic and nationalistic tension were held in check by the Yugoslavian Government. Since 1991 Yugoslavia has divided into five countries: Croatia, Macedonia, Slovenia, Bosnia-Herzegovina, and Serbia-Montenegro. Of these new countries, Bosnia-Herzegovina is the poorest and least industrialized. Bosnia-Herzegovina is also the most ethnically diverse and has been the region of greatest conflict.

<u>Country (Population)</u>	<u>Dominant Ethnic Groups</u>
Slovenia (2.0 million)	91% Slovenian
Croatia (4.8 million)	78% Croatian
Serbia (10.6 million)	63% Serbian, 19% Muslim
Macedonia (2.2 million)	67% Macedonian, 26% Muslim
Bosnia (4.4 million)	40% Muslim, 33% Serbian, 17% Croatian

The population in the FRY is mostly concentrated in the region's interior, rather than along the coast. The interior region has a very rugged terrain in most areas and has also been the site of frequent earthquakes. The climate is typical of central Europe. The average daily temperature and average relative humidity for selected cities are found in Appendix A.

This guide is designed to help unit leaders accomplish the mission by providing information on how to sustain soldiers' health and fitness while deployed to the FRY. It provides an aid to identify anticipated health hazards and describes some actions which can be

taken to minimize the effects of these hazards. Because it is designed to meet the needs of non-medical units, it does not provide detailed medical information.

The guide is organized to be both a pre-deployment planning resource and a reference for use during operations. It provides information to understand and identify hazards while also providing guidance for prevention and control. The guide is best utilized by reading it in its entirety before deployment, and then using it as a reference during operations.

#### **INFECTIOUS DISEASE HAZARDS AND HYGIENE**

Conditions exist for an explosive outbreak of infectious diseases within the Former Republic of Yugoslavia (FRY). These conditions include large numbers of poorly nourished, exhausted people crowded in besieged towns, refugee camps and detention compounds. In the areas most affected by the civil war, the public health infrastructure is completely broken down. In many areas, safe water and food supplies are scarce. The problems of untreated water and contaminated food are compounded by disruption of sewage and waste disposal systems. The potential for epidemic spread of disease exists year round, but the greatest potential for spread occurs in the warmer months.

As soldiers will be in close contact with local populations, troops are vulnerable to contagious diseases. Many diseases not only seriously affect individual soldiers but rapidly degrade the mission capability of entire units. For these reasons great care is needed to prevent infectious diseases before epidemics occur. Fortunately, effective countermeasures exist for most of the diseases encountered. Many of the diseases encountered in the FRY,

even some of the potentially serious ones, begin with flu-like symptoms: headache, muscle aches, and fever. Therefore, flu-like symptoms must be treated seriously.

#### **A. DISEASES FROM FOOD AND WATER**

##### **1. Problems with Food and Waterborne Illness**

The greatest threat to soldier health is infectious diarrhea resulting from contamination of water and food by bacteria, viruses and parasites. Contamination occurs because of improper water purification, inadequate cooking, handling, or storage of food and water, and breakdowns in field sanitation and local public health services. Diarrheal diseases from water and food are of particular military significance because large numbers of soldiers can be simultaneously affected with disastrous consequences for mission readiness. Diarrhea is the principal symptom, but nausea, vomiting, fever and other symptoms are also caused by these diseases. Diarrhea, especially when vomiting or fever are present, causes dehydration. The most common condition is simple diarrhea with frequent, watery stools and abdominal cramping for three to five days. Other diseases, like typhoid are severely debilitating, even life-threatening. Parasites (amoebas, giardia, tapeworms, etc.) consumed in water or undercooked food, especially meat and fish, also cause prolonged intestinal disease.

##### **2. Countermeasures for Food and Water Illness**

a. **Drink water or beverages only from approved U.S. military water sources**, which are properly treated and routinely tested. Be aware that even bottled water from unknown or



unapproved sources can be contaminated. If in doubt, soldiers should treat water in their canteens with iodine tablets. **Assume all ice is contaminated.**

b. **Consume food only from approved U.S. military sources.** Perishable food must be refrigerated, adequately cooked and served steaming hot. Dairy products, milk, butter, cheese or yogurt from unapproved sources are especially hazardous. Soldiers eating only standard military rations (e.g., MREs or tray packs) are at low risk of diarrheal disease.

c. Follow proper field sanitation procedures for disposal of waste and for maintenance of latrines.

d. Do not add beverage flavorings to bulk water supplies because they block the action of the disinfectants.

e. Practice good personal hygiene. Wash your hands to protect yourself and others from infectious diseases. Do not bathe, swim or wash clothes in local water such as rivers and ponds.

**Diarrheal disease rates during Desert Storm/Shield were the lowest in U.S. military history.** Strict adherence to approved food and water source guidelines produced this result. Sticking to tray packs, MREs and approved fluids prevent diarrheal disease.

### **3. Care and First Aid for Diarrheal Disease**

a. Individuals with severe, bloody, or prolonged diarrhea (more than three or four days) and/or vomiting should be medically evaluated.

b. Dehydration is a concern with all diseases causing diarrhea and vomiting. To prevent dehydration, special efforts should be made to assure that adequate fluids and salts are consumed. If "A" rations are available, the ingredients for replacement fluids can be obtained from field kitchens. See Appendix B for fluid replacement recipes which can be used to treat fluid loss due to dehydration. In addition, commercial "sports-drinks" are acceptable beverages to treat dehydration.

## **B. DISEASES FROM INSECTS**

### **1. Problems with Insect-borne Diseases**

Several species of disease carrying insects inhabit the Former Republic of Yugoslavia (FRY). Some diseases spread by insects are serious and can be fatal. The risk of infection from insects is seasonal. Peak months of tick activity are March through September. Sand flies are prevalent from May to October, with most activity between dusk and dawn. Mosquitoes are also common during spring and summer months, especially in wet, marshy or flooded areas. Examples of insects and types of disease they transmit include:

<b>Ticks -</b>	Tick Borne Encephalitis (inflammation of the brain), Crimean-Congo Hemorrhagic Fever, Lyme Disease, Relapsing Fever
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<b>Sand Flies -</b>	Sandfly Fever, Oriental Sore (Cutaneous Leishmaniasis), Kala Azar (Visceral Leishmaniasis)
<b>Mosquitoes -</b>	West Nile Fever, Sindbis, Tahnya Fever
<b>Lice and Fleas -</b>	Relapsing Fever, Typhus, Plague

All biting flies and insects are considered carriers of disease and steps should be taken to control their numbers and prevent biting. Almost all diseases from insects cause severe flu-like symptoms with fever, muscle aches, weakness and headaches. Other signs or symptoms may include rashes, swollen lymph nodes, joint pain, shaking chills, sweats, nausea or vomiting. Therefore, all flu-like symptoms must be treated seriously.

## **2. Countermeasures for Insect-borne Diseases**

Prevention of diseases transmitted by biting insects depends on personal protective measures and area insect control. If used rigorously, these measures should provide protection against biting insects.

- a. Apply insect repellent, skin lotion, DEET extended duration (NSN 6840-01-284-3982) to exposed skin and to the first three inches of skin covered by the uniform during the months of insect activity. This skin repellent is effective up to 12 hours, so it should be applied at least two times per day during periods when insects are prevalent.

b. During the months of insect activity, protect clothing with insect repellent. Insect repellent, permethrin aerosol (NSN 6840-01-278-1336) should be applied to the BDU until the uniform appears wet, and reapplied after every six washings. Treating bed netting may be useful in areas where sand flies are numerous since they are small enough to penetrate untreated netting.

c. Shake out clothing and bedding and check for insects before use.

d. Keep sleeping surfaces off the ground.

e. Conduct periodic, personal and "buddy" checks for ticks and other biting insects, especially when moving cross country in brush or grass. Ticks should be removed from the skin by firmly grasping the head of the tick with tweezers and removing the tick with a gentle steady pull.

f. Wear and blouse trousers and shirts properly to prevent tick bites. Trouser legs should be tucked inside boots.

g. Remember measures to control insects include good personal hygiene, proper disposal of garbage and human waste, and keeping food and water covered. Insect breeding areas such as pools of water in old tires, cans, buckets and ditches should be drained.

## **C. DISEASES FROM ANIMALS**

### **1. Problems of Diseases from Animals**

Animals in the FRY can transmit diseases directly or indirectly to soldiers. **Hemorrhagic fever** with renal syndrome (fever with kidney failure) is transmitted from mice to individuals who breathe infected dust-like particles of animal waste. **Brucellosis**, **"Q" fever**, and **anthrax** are found in goats, sheep and cattle. Infection may result from consumption of local milk and other dairy products, from breathing dust-like particles from infected animals or their feces and direct contact with animal tissues, urine or blood. Other diseases such as **leptospirosis** (Mud fever) may occur after wading or lying in water or mud infected with the urine of disease-carrying animals (cattle, dogs, horses, pigs, rats and others). These diseases cause headache, fever, chills, sweating and body aches plus other more specific symptoms.

Dogs, cats, livestock and wild animals transmit **rabies through bites and scratches**. **Animal bites or scratches must be evaluated by medical personnel**. If a soldier is infected with rabies and does not receive anti-rabies shots immediately, the disease is always fatal.

### **2. Countermeasures for Diseases from Animals**

- a. Avoid contact with domestic or wild animals. **Camp pets should be forbidden.**
- b. Avoid contact with meat, hides, and animal carcasses. Blood, urine and wastes of animals should be avoided.

c. Do not work or live in sheds, or other areas where livestock has been housed or slaughtered.

d. Elevate or cover spouts on Lyster bags and other water sources to prevent animals from licking or otherwise contaminating them.

### **3. Care of Diseases from Animals**

As with other infectious diseases, a medical evaluation should be obtained as soon as possible after the onset of symptoms. *If timely medical attention is received, most animal diseases that can be spread to soldiers, even rabies, are preventable or treatable.*

## **D. DISEASES FROM PEOPLE**

**1. Respiratory tract infections**, such as colds, flu, sinusitis and strep throat, are common especially in crowded living conditions. Although these infections are relatively mild, they affect many soldiers at once and can have a serious impact on military readiness. Respiratory diseases are second only to diarrheal diseases as a cause of lost duty time. To control respiratory disease transmission, crowding in living spaces should be minimized. Good ventilation should be maintained and soldiers who sleep near others in tents should alternate sleeping positions (head to foot) to reduce the spread of respiratory diseases through the air. These measures also help prevent the spread of more serious diseases such as **tuberculosis**, a potential problem in the FRY, especially near refugee and detention camps.

2. **Meningitis** (an infection of the lining of the brain) is spread through direct contact with droplets from the nose and throat of infected people. It can be rapidly fatal. The meningococcal vaccine given to U.S. soldiers on entry to the military protects against the types of meningitis encountered in the FRY. The same protective measures that prevent respiratory infections also prevent the spread of meningitis.

3. **Sexually transmitted diseases**, including gonorrhea, syphilis, genital warts, herpes, hepatitis B infection, and infection with the AIDS virus (HIV), all occur in the FRY. Abstinence is the best way to prevent sexually transmitted diseases. If sexual contact is not avoided, condom use is necessary to minimize disease risk. Many of these diseases are potentially serious; a physician should be consulted if genital discomfort, sores (painful or painless), or unusual discharge develop.

4. **Hepatitis**, a liver disease, can be caused by several types of viruses. Epidemic hepatitis (type A or type E) is spread from person to person through contaminated water or food. Epidemic hepatitis has been contracted by U.N. troops in Bosnia-Herzegovina. Serum hepatitis (type B or type C) is spread by sexual contact, blood transfusion, or contaminated needles and medical instruments. Both forms of hepatitis cause fever, intestinal symptoms and jaundice (yellow skin). When a person is infected with one of these viruses, many weeks may pass before any symptoms emerge.

Immune serum globulin (ISG) "shots" protect against the most common type of hepatitis (type A), but do not protect against other forms of hepatitis (types B, C or E). Booster shots of ISG are needed every three months to maintain protection. Since hepatitis A and E are acquired from contaminated food and water, they can be prevented by the same measures

used to prevent any of the other food and waterborne diseases (see Section A in this part of the guide).

Hepatitis B vaccine is protective and is required for high risk occupations such as medical personnel. Other protective measures against hepatitis B include wearing gloves and other protective coverings (such as masks, gowns and goggles) when exposed to blood or body fluids. Wash hands and other body parts immediately after contact with body fluids. **Hepatitis prevention is critical since viral hepatitis IS NOT treatable.**

## **E. DISEASES AND IRRITATIONS OF THE SKIN**

### **1. Problems With Skin Diseases and Irritations**

Exposed skin is particularly vulnerable to drying conditions which may cause cracking or scaling. Conversely, sweating and chafing, combined with humid conditions can result in irritation, breakdown and erosion of the skin, especially in the groin, abdominal folds, armpits, under breasts and where the backpack or load-carrying equipment rubs. Accumulation of sweat in socks and friction from boots cause blisters which leave the feet vulnerable to infection. Skin conditions predispose soldiers to bacterial and fungal infections.

### **2. Countermeasures for Skin Diseases and Irritations**

a. Practice good personal hygiene to protect the skin. Handwashing and bathing or showering should be done as often as practical. If bathing is not possible, areas that sweat should be cleaned with a wash cloth at least daily (sponge bath).



- b. Keep uniforms and underwear clean and dry.
- c. Keep feet clean and dry. Frequently change to dry socks.

**3. Treatment and care of skin problems**

- a. Use non-irritating moisturizing skin cream if skin becomes dry or cracked.
- b. Dry moist areas of skin if irritation develops and apply powders such as talc.
- c. Treat athletes foot, jock rash, and similar fungal rashes with appropriate anti-fungal powders and creams to alleviate the condition and to prevent secondary bacterial infections.
- d. Persistent rashes in moist areas such as the groin, under breasts or on the feet require medical evaluation. Female soldiers who develop persistent vaginitis should seek medical attention. Soldiers who develop a persistent sore, especially with red streaks or swollen lymph nodes, should also seek medical attention.

**F. VACCINES AND OTHER PREVENTIVE MEASURES**

1. Vaccines are available to prevent many infectious diseases. The U.S. military requires certain vaccinations (immunizations) routinely and others for specific deployments. Vaccines recommended by U.S. European Command (EUCOM) prior to deployment at the time of this writing (June 1993) include:

- Immune Serum Globulin (ISG) shot - first dose predeployment and a booster shot every three months to prevent Hepatitis A
- Tetanus-Diphtheria - last shot within 10 years
- Oral Polio - primary 3-dose series, plus one adult booster
- Influenza (current year)
- Typhoid - 2-shot basic series, plus booster shot in last three years
- Measles - record of at least one shot, or be born before 1957
- Hepatitis B - 3-shot series, for all medical personnel

All of these vaccines are approved by the U.S. Food and Drug Administration (FDA). Medical personnel are responsible for screening shot records and administering vaccinations. Soldiers must take responsibility for making sure shot records are up-to-date and that they receive the required immunizations.

2. Outbreaks of childhood diseases, such as measles, mumps, rubella, and polio, may occur especially among young children in the FRY. Soldiers who are unsure whether they are immune, due either to vaccination or previously having had the disease, should check with medical personnel.

3. Screening soldiers for tuberculosis (TB) by skin testing before and after deployment is desirable.

## **PLANT, INSECT, AND SNAKE HAZARDS**

Many native plants, animals, snakes and insects in the Former Republic of Yugoslavia (FRY) can cause harm to soldiers. The threat ranges from rashes to fatal poisoning. The threat is similar to what might be expected in the U.S. during field training exercises except U.S. soldiers may be unfamiliar with native species and unaware of the potential danger.

### **A. PLANTS**

#### **1. Problems with Plants**

Some plants in the FRY have thorns which can puncture the skin and cause infections. Other plants (*Clematis*) can cause rashes just by touching the skin. Contact with the smoke from the burning of these plants can also cause skin rashes and damage to the lungs.

#### **2. Countermeasures for Problems with Plants**

- a. Avoid skin contact with harmful plants. Use clothing as a protective barrier for the skin.
- b. Clean clothing after contact with dangerous plants. Clothing can be decontaminated by washing with soap and hot water.
- c. Seek medical evaluation if injury or poisoning from plants occur.

## **B. INSECTS, SPIDERS, CENTIPEDES AND SCORPIONS**

### **1. Problems with Insects, Spiders, Centipedes and Scorpions**

There are many species of poisonous insects, spiders, centipedes and scorpions in the FRY. The effect of their poisons can range from severe pain and ulceration of the skin to death. These small and inconspicuous animals are likely to be encountered in buildings, tents and bunkers.

### **2. Countermeasures for Insect, Spider, Centipede and Scorpion Problems**

- a. Prevent injury from poisonous insects, spiders, centipedes and scorpions by avoiding contact. This means extra vigilance in areas where these creatures live.
- b. Avoid sleeping on the ground.
- c. Shake out boots, uniforms, and bedding before use to get rid of any animals that may have crawled in.

### **3. Care for Insects, Spiders, Centipedes and Scorpion Problems**

Seek medical attention if bitten or stung. First aid includes icing the wound and immobilizing the body part involved. Keep the injured soldier at rest. Tourniquets or cutting the wound to suck out the poison are not helpful and may cause harm.

## **C. SNAKES**

### **1. Problems with Snakes**

Death from snakebite is rare but does occur in Europe. The FRY has several poisonous snakes. They include the highly toxic sand or long-nosed viper. This snake is found throughout the FRY, but most often at moderately high altitudes on gravelled or rocky hillsides facing the sun. Other poisonous snakes include the European viper (common adder), and the meadow viper (field adder). Many of these snakes are well camouflaged and few give warning signals.

### **2. Countermeasures for Problems with Snakes**

- a. Do not handle or play with snakes.
- b. Avoid areas where snakes may be found.

<b>ALL SNAKES SHOULD BE CONSIDERED POISONOUS.</b>
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### **3. First Aid for Snake Bites**

Get medical attention immediately if bitten by a snake. First aid consists of immobilizing the bitten arm or leg and keeping the soldier at rest. Apply ice to the bite to slow the spread of

venom and reduce pain. Tourniquets and attempts to suck venom out of the wounds can cause more harm than good.

### **ENVIRONMENTAL HAZARDS**

The Former Republic of Yugoslavia (FRY) has three distinct climates: moderate continental climate in the mountain areas, continental climate in the plain areas, and mediterranean climate in the coastal areas. Average temperatures reach almost 90°F (32°C) in the summer and 20°F (-7°C) in winter months (see Appendix A). The Mountain ranges in the FRY have peaks with maximal elevations of approximately 9,000 ft (2750 m). Military operations in the mountains expose soldiers to the risk of altitude illness and injuries from falls in rugged terrain. *Because of seasonal extremes of heat and cold, soldiers may experience some limitation in their ability to do heavy physical work and may be at risk for heat and cold illness/injury.*

#### **A. MOUNTAINOUS TERRAIN**

Mountainous regions in the Former Republic of Yugoslavia (FRY) can affect soldiers through lower oxygen pressure in the air at higher elevations ("thin air"), and through steep and rugged terrain features. "Thin air" is a popular term used to describe reduced available oxygen caused by lower barometric pressure at increased altitude. Soldiers' bodies adjust (acclimatize) to "thin air" by increasing breathing rate, heart rate, and number of red blood cells as well as decreasing total body fluid. When their bodies do not adequately adjust, soldiers experience altitude illnesses.

## **1. Problems with Mountain Environments**

The "thin air" in mountains can cause altitude illness, disrupt sleep, and decrease physical and mental work capabilities. As many as 45% of soldiers who travel from low areas to mountains over 5,000 ft (1500 m) in the FRY may develop symptoms of Acute Mountain Sickness (AMS) during the first few days. These symptoms are similar to a "hangover" from drinking too much alcohol, and include headache, nausea, general weakness and fatigue. Some soldiers may get sick enough to vomit. AMS symptoms start 12-24 hours after arriving in the mountains. These symptoms go away in one to three days as the body adjusts to lower oxygen availability. Hard physical work during the first few days in the mountains increases the risk of getting AMS. Being in good physical condition does not prevent it. Although AMS is usually not dangerous to a soldier's health, it may affect performance and mission accomplishment.

Another frequent altitude-related health problem in the mountains of the FRY is poor sleep. Soldiers may experience bad dreams and episodes where they stop breathing for as many as 10-15 seconds while they are sleeping. Poor sleep makes soldiers tired and affects their concentration the next day. There is also a remote possibility that soldiers could develop a dangerous excess of fluid in their brain or lungs called "high altitude edema" which could be fatal if not treated.

As a result of "thin air", soldiers will experience a small decrease in their ability to do hard physical work. Their physical work capacity will recover somewhat over several weeks as their bodies adapt. Likewise, performance of some mental tasks and ability to concentrate may be decreased, but will recover with time.

Rugged terrain and steep slopes in the mountains of the FRY can cause falls and other accidents. The risk of falling is great because "thin air" can cause soldiers to be careless in their activities. Soldiers can get cuts, bruises, sprains, broken bones and head injuries from falling in the mountains. Some of these injuries may be serious enough to cause death or adversely affect performance of duties.

## **2. Countermeasures for Problems in Mountain Environments**

a. Allow the body to gradually adapt to the "thin air" to prevent altitude illnesses. This can be accomplished by maintaining a slow rate of ascent, or by resting for a day (and a night) at 5,000 ft (1500 m) before continuing to higher elevations.

b. Limit physical activity, if possible, during the first 24 to 48 hours in the mountains to reduce the risk of getting acute mountain sickness.

c. Taking a medicine called "acetazolamide" or "Diamox®" before starting up into the mountains may prevent severe symptoms of altitude illness in susceptible soldiers. Side effects of acetazolamide include tingling sensations in the fingers, toes and lips. It also causes carbonated beverages such as soda-pop to taste unpleasant. At the relatively low altitudes in the FRY, acetazolamide is probably unnecessary for most soldiers. Leaders should plan for decreased physical work capabilities. Caution and a system of double-checking mental tasks may help prevent mistakes from decreased mental performance.



d. Plan for decreased physical and mental work capabilities. These reduced capabilities caused by "thin air" can only be prevented by breathing bottled oxygen, which is not practical in most military operations.

e. Maintain adequate hydration in mountains by drinking fluids, but avoid alcoholic beverages.

f. Employ caution to reduce the danger of falling when walking, running or climbing in the mountains. Recreational rock and mountain climbing should be discouraged because it is not mission-essential and increases the risk of injuries. Caution and specialized techniques should be used when rescuing fallen personnel to prevent injury to the victim and rescuers.

### **3. First Aid for Illnesses in Mountain Environments**

a. Soldiers with acute mountain sickness (AMS) should avoid physical exertion and take fluids to stay hydrated.

b. AMS can be treated with the medication acetazolamide (Diamox®). The headache caused by AMS can often be helped by taking medications like ibuprofen (Advil® or Motrin®) or indomethacin (Indocin®). Aspirin and acetaminophen (Tylenol®) are often less effective, but can be used.

c. Poor sleep in the mountains can often be improved with acetazolamide. Many sleeping pills that work well at lower altitudes, can worsen acute mountain sickness or cause excess fluid (edema) in the lungs or brain at high altitudes.

## **B. COLD WEATHER**

Cold weather can lower body temperature, resulting in impaired performance and cold injuries. When body heat loss exceeds the body's ability to produce and retain heat, body temperature decreases. When body temperature falls below 95°F (35°C), hypothermia, a life-threatening condition, follows. To reduce heat loss, the body decreases blood flow to the arms, legs and skin. Although this protects the internal organs, the decreased blood flow increases susceptibility of hands, feet, ears, etc. to both non-freezing (trench foot) and freezing (frostbite) cold injuries.

### **1. Problems with Cold Environments**

**Cold stress.** Cold weather is often accompanied by wind, rain, snow and ice, which can worsen the effects of cold. For any given air temperature, the potential for body-heat loss, skin cooling and decreased body temperature is increased by wind and moisture. Soldiers protect themselves from cold weather by using clothing and shelter. When this protection is inadequate, their bodies have defense mechanisms to help maintain the correct temperature. The body protects vital internal organs (brain, heart) by reducing skin blood flow and increasing shivering. When a soldier notices these responses, it is a signal that clothing and shelter are inadequate. Heat production is increased by shivering and increased physical activity. The more vigorous the physical activity, the greater the heat production. However, high intensity physical activity can cause sweating which may increase the risk of cold injury if clothes become wet. Also, inactivity for long periods increases the risk of cold injury. This is a particular concern for defensive fighting positions (foxholes) or small vehicle crew compartments where movement is restricted.

Because cold-weather clothing is heavy and cumbersome, it increases the energy required for physical activity. This increased effort can result in overheating and sweating especially during hard work, and can contribute to increased fatigue. Heavy work and sweating leads to dehydration, which increases susceptibility to cold injury. In addition, poorly conditioned soldiers are more susceptible to cold injury. They tire more quickly and are unable to stay active enough to keep warm. Lean soldiers are also more susceptible to cold injury because they lack body fat, which is good insulation against cold. Illness, poor nutrition, and injury limit a soldier's ability to protect against cold injury.

**Alcohol increases susceptibility to cold injury by increasing heat loss and reducing shivering.** Alcohol increases urine output which may lead to dehydration. Also, alcohol blunts the senses and impairs judgement, so the individual may not feel the signs and symptoms of developing cold injury. In addition, any source of nicotine, such as smoking or chewing tobacco, can increase susceptibility to cold injury.

Metal objects and liquid fuels left in the cold can pose a serious hazard. Fuels and solvents remain liquid at very low temperatures. Skin contact with fuel or metal at below freezing temperatures can result in nearly instantaneous freezing injury.

Air temperature decreases about 3.6° F (2.0°C) with every 1000 ft (300 m) increase in elevation. Winds are usually more severe at high altitude and there is less cover above the tree line. Soldiers are more susceptible to frostbite and other cold injuries above 8000 ft (2400 m) than at sea level, due to the lower temperatures, higher winds and lack of oxygen.

**Cold Injuries.** Soldiers operating in cold environments are at risk for cold injuries that may reduce unit readiness. These include: chilblain, trenchfoot, frostnip, frostbite and hypothermia.

Chilblain is a nonfreezing injury which, although painful, causes little or no permanent impairment. It appears as tender, red, swollen skin, that is hot to the touch and may itch. This can worsen to an aching, prickly ("pins and needles") sensation and then numbness. It may develop in only a few hours in skin exposed to cold.

Trenchfoot develops when the feet are exposed to moisture and cold for prolonged periods (12 hours or longer). The combination of cold and moisture softens skin, causing tissue loss and, often, infection. Untreated trenchfoot can eventually require amputation. Often, the first sign of trenchfoot is itching, numbness or tingling pain. Later the feet may appear swollen, and the skin faintly red, blue or black. Commonly, trenchfoot shows a distinct "water-line" coinciding with the water level in the boot.

Frostnip involves freezing of water at the skin surface. The skin will become reddened and possibly swollen. Although painful, there is usually no further damage after rewarming. Repeated frostnip can dry the skin, causing it to crack and be sensitive. Frostnip should be taken seriously since it may be the first sign of impending frostbite.

Frostbite involves freezing of deeper layers of tissue. Ice crystal formation and lack of blood flow cause tissue damage. Skin freezes at about 28°F (2.2°C). The skin becomes numb and turns a grey or waxy-white color, and is cold to the touch and may feel stiff.

Hypothermia is a life-threatening condition in which body temperature falls below 95°F (35°C). Generally, body temperature will not fall until after many hours of exposure to cold air or shorter exposure to cold water. Body temperature can fall even when air temperatures are above freezing if conditions are windy, clothing is wet, and/or the soldier is inactive. The first signs of developing hypothermia include confusion, bizarre behavior and withdrawal from group interaction. Victims of hypothermia may be unconscious, with nearly undetectable breathing and pulse.

## **2. Countermeasures for Problems in Cold Environments**

- a. Conduct training for cold weather operations before deployment. Training and education about cold weather hazards are essential because soldiers do not acclimatize very well to the cold.
- b. Maintain physical fitness since high levels of fitness are beneficial for participation in cold-weather operations.
- c. Cold weather activity guidelines are presented in Appendices C and D.
- d. Minimize periods of inactivity in cold conditions.
- e. Minimize risk of cold injuries in fighting positions, sentry, and observation points by placing pads, sleeping bags, tree boughs, etc. inside these positions.

f. Maintain adequate food consumption to make up for increased energy requirements in cold weather. Eat "normal" meals with frequent nutritious snacks from extra foods left over from mealtime.

g. Maintain proper hydration to reduce susceptibility to cold injuries. Soldiers participating in cold-weather operations should consume about a half a quart (half a canteen) of water with breakfast, lunch, dinner and before going to sleep at night. An additional half quart should be consumed every hour during the workday (more if the work is strenuous enough to cause the individual to sweat) for **a total of at least five to six quarts per day**.

h. Monitor hydration status by noting the urine color and frequency of urination. ***Dark yellow urine and infrequent urination indicate that fluid consumption should be increased.***

i. Avoid alcohol and tobacco because of their adverse effects in the cold.

j. Keep hands, feet and skin dry. Change socks whenever they become wet or sweaty. Wet socks can be air-dried and carried under BDUs to warm them.

k. Keep clothing clean. Dirty clothing packs down, loses insulation value and prevents evaporation of sweat.

l. Wear clothes in layers. Layered clothing allows soldiers to adjust to changes in temperature or physical workload. Wearing layered clothing is especially important for soldiers

whose duties require them to move in and out of heated spaces, or to periodically undertake vigorous physical activity.

m. Wear clothes that allow air flow (ventilation) for evaporation of sweat. Physically active soldiers will sweat even in extremely cold weather. If sweat does not evaporate, it will accumulate. Wet clothing loses its insulation value increasing the soldiers risk of cold injury.

n. The standard light-duty leather glove worn with woolen inserts, provides inactive persons with about 30 minutes of protection from frostbite when air temperature is 0°F (-17.8°C). If temperatures are warmer and/or soldiers are physically active, this glove will provide protection for longer periods. This glove is not waterproof.

o. Trigger-finger or Extreme Cold Weather mittens with liners should provide additional protection when air temperature is below 0°F (-17.8°C), or more than 30 minutes of inactive exposure is anticipated.

p. Shake out sleeping bags before using to add air to the insulation (lofting), which will improve insulation value. Use layers of tree boughs or mats under the sleeping bag to prevent body heat loss. Soldiers should keep their heads outside sleeping bags, so that moisture from

**WHEN USING COLD-WEATHER  
CLOTHING, REMEMBER C-O-L-D:**

keep it-----**C**lean

avoid-----**O**verheating

wear it-----**L**oose in layers

keep it-----**D**ry

their breath will not accumulate in the bag. Air out sleeping bags as often as possible to evaporate moisture.

q. Sleep in long underwear and socks with all other clothing hung up to dry when in tents. In improvised shelters, only boots and the outermost clothing should be removed for sleeping.

r. Use lip balm to prevent chapped and sunburned lips (Cold Climate Lipstick, Antichap, NSN 6508-01-277-2903). Skin moisturizing lotion may help the skin retain water.

### **3. First Aid for Cold Injuries**

a. For Chilblain and Trenchfoot, prevent further cold exposure. Remove wet or constrictive clothing. Gently wash, dry and elevate the injured part. Cover the injured area with layers of loose warm clothing and allow to rewarm. Pain and blisters may develop. Do not pop blisters, do not apply lotions or creams, do not massage, do not expose to extreme heat and do not allow victim to walk on injury. Seek medical attention.

b. For Frostbite, prevent further cold exposure and remove wet, constrictive clothing. Gradually rewarm the injury by direct skin-to-skin contact between the injured area and non-injured skin of the victim or a buddy. Evacuate for medical treatment. Victims with foot injuries should not walk, but should be evacuated by litter. Do not thaw frostbite injuries if there is a possibility of refreezing during evacuation.



**Do not thaw frostbite injuries if there is a possibility of refreezing during evacuation.**

c. For Hypothermia, prevent further cold exposure and remove wet clothing. **Initiate CPR if required.** Rewarm by covering with blankets, sleeping bags and with body-to-body contact. Handle gently during treatment and evacuation because rough handling can cause dangerous irregular heartbeats in hypothermic victims.

## **C. HOT WEATHER**

Heat stress depends on physical activity (work rate), hydration, heat acclimatization, clothing and climatic conditions. Normally, excess body heat is lost through several physiological mechanisms; however, when air temperature is above skin temperature, evaporation of sweat is the only mechanism for heat loss. Following sweat loss, water must be consumed to replace the body's fluid. If the body fluid lost through sweating is not replaced, dehydration will follow. Dehydration will lead to additional heat strain, reduced work performance and mission capability.

### **1. Problems in Hot Environments**

**Heat Stress.** Heat, high relative humidity and exposure to the sun make it difficult for the soldier to regulate body temperature. Hot weather increases soldiers' water requirements, primarily through loss of body water as sweat. Sweat rates can be high even when the skin looks and feels dry, since sweat will evaporate quickly in relatively dry and windy conditions. If

soldiers do not drink sufficient amounts of water to replace sweat loss, they will dehydrate. Dehydration cancels the benefits of heat acclimatization and physical fitness, increases the risk of heat illness and reduces work capacity, appetite and alertness. The greater the dehydration, the more severe the adverse effects will be.

Soldiers do not sense when they are dehydrated and usually do not replace body water losses, even when drinking water is readily available. Soldiers under stress experience "voluntary" dehydration, about 1.5 qts (1.4 l) below their ideal hydration status without adequate sense of thirst. **Thirst is a poor indicator of body water needs.** Soldiers must constantly remind themselves, or be reminded, to drink water in order to replace lost water. Ensuring regular consumption of water is the responsibility of the unit leader and NCOs. **Guidelines for water replacement are provided at Appendix F.**

**Heat Injury/Illness.** Sick soldiers who are not taken care of early become more serious casualties and reduce the unit's mission capability. One heat casualty is usually followed by others. The occurrence of a heat casualty should be considered a warning that the entire unit may be at immediate risk - this is the Weak Link Rule: **AS SOON AS THE FIRST HEAT CASUALTY OCCURS, ASSESS THE STATUS OF THE WHOLE UNIT.** *There are several* heat illnesses/injuries of varying degrees of severity including heat cramps, heat exhaustion and heat stroke.

Heat Cramps are muscle cramps, involving less than the whole muscle, primarily occurring in the abdomen, legs and arms. Such cramps are caused by excessive salt and water losses. Heat cramps most often occur in soldiers who are not acclimatized to the heat, and can be avoided by maintaining proper nutrition and hydration.

Heat Exhaustion includes symptoms of fatigue, nausea, dizziness, fainting, vomiting, mild changes in mental function (e.g., disorientation, irritability) and elevated temperature. Heat exhaustion can be avoided by employing appropriate work-rest cycles and maintaining full hydration (see Appendix F).

Heat Stroke includes all of the above signs and symptoms, but is more severe and can be fatal. The victim may be hot and disoriented or unconscious. Heat stroke can be avoided by employing work/rest cycles and maintaining full hydration.

## **2. Countermeasures for Problems in Hot Environments**

The key to preventing heat illness and sustaining performance is knowledge of the environmental conditions. Leaders must have accurate weather information for the location. Heat illness prevention guidance is based on Wet Bulb Globe Temperature (WBGT) readings (TB MED 507, FM 21-11, and GTA 8-5-45, see References). Appendix E provides tips for measurement of WBGT. Measures to prevent heat illness fall into several categories: acclimatization and physical fitness, hydration and nutrition, work rest cycles, reduced heat exposure, and clothing, equipment and supplies.

### **a. Acclimatization/Physical Fitness**

1. Attain the best possible physical fitness and heat acclimatization prior to deployment. Maintain adequate levels of physical fitness after deployment with maintenance programs tailored to the environment. Physically fit soldiers acclimatize to heat more rapidly than less fit soldiers.

2. Expect significant heat acclimatization to require at least four to five days. Full heat acclimatization takes about ten days with two hours per day of carefully supervised exercise in the heat. Increase physical activity each day until full acclimatization is achieved.

3. Realize that **acclimatization does NOT reduce, and may actually increase, water requirements**. Heat acclimatization increases sweating which enhances evaporative cooling. Increased sweating requires additional water consumption.

**IT IS DANGEROUS AND INAPPROPRIATE TO  
TRY TO REDUCE WATER CONSUMPTION.**

b. **Hydration and Nutrition**

1. Emphasize the importance of maintaining hydration. Almost any contingency of military operations will act to interfere with maintenance of hydration. The guidance for water consumption requirements given in Appendix F is approximate and was developed assuming that soldiers would be fully acclimatized, physically fit, fully hydrated and rested. If soldiers are not fully acclimatized and hydrated, the work-rest guidance (also in Appendix F) must be changed to allow more frequent rest.

2. Establish mandatory drinking schedules which replace water lost by sweating. Use the tables provided in Appendix F to match the environmental and operational demands to

the water requirement. Remember water requirements may exceed the body's ability to absorb fluid. Most soldiers can only absorb 1.2 qts (1.1 l) per hour. Soldiers should not be expected to drink more than this amount per hour, and water requirements can be made up over longer periods of time.

3. Plan operations to provide water resupply points at a maximum interval of every three hours. One-hour intervals are more desirable. Carry as much water as possible when separated from approved sources of drinking water. Assure soldiers always have at least one full canteen in reserve; know when and where water resupply will be available. Soldiers can operate and live longer without food than without water.

4. Complete consumption of rations with use of salt packets is essential to provide an adequate salt intake. Soldiers may have a few days of increased salt requirements upon initial deployment because sweat is more salty prior to acclimatization. **Salt supplementation is not appropriate** unless medically indicated and supervised by medical personnel.

5. Monitor hydration status by noting the color and volume of a soldier's urine. Soldiers should be taught that the lighter the urine color, the better hydrated a soldier is; and that **dark yellow urine and infrequent urination indicate that fluid consumption should be increased**. Squad leaders should attempt to monitor urine color of soldiers.

6. Minimize voluntary dehydration by removing barriers to drinking. Make flavored, cool water accessible and provide enough time to drink and eat. Remember, soldiers drink most of their water with meals, and water availability improves food consumption.

7. Carbohydrate and electrolyte beverages (sports-drinks) are not required, and if *used should not be the only source of liquid*. For healthy soldiers, these beverages generally provide no advantage over water, however, they can enhance fluid consumption because of their flavor.

8. Drink water in preference to splashing it on skin. Water splashed on the skin is wasted water; it might briefly improve comfort, but does little to sustain performance and avoid heat illness.

**c. Work-Rest Cycles and Reduced Heat Exposure**

1. Review procedures for the management of work-rest cycles and maintenance of adequate water consumption. Establish work-rest schedules using the Tables in Appendix F.

2. Prevent a dangerous increase in body temperature by minimizing heat production through reducing work pace and increasing rest periods. Body temperatures can rise very rapidly due of the combination of heat, clothing/equipment worn and sustained activity.

3. Plan to perform heavy work (including PT) in early morning or cool evening hours in hot weather whenever possible. In addition, provide shade whenever possible.

**d. Clothing, Equipment and Supplies**

1. Wear uniforms appropriately to protect against sun, wind and other hazards. Use hats, head cloths and sunscreen as necessary. Remember, soldiers must be cautious to

counterbalance the hazards of sun, wind, insects and other factors with the desire to loosen and take-off clothing to improve ventilation and increase body heat loss.

2. Change socks at least twice a day.

3. Keep clothing clean since clean clothes protect better and help prevent skin rashes. Whenever possible, wash clothing and air-dry or sun-dry.

### 3. First Aid for Heat Illness

a. Watch for signs of overheating which include: inability to work, red or flushed face, confusion or disorientation and fainting. It is always better to take care of a problem early. When in doubt, treat as a heat illness.

b. Immediately get heat-stricken soldiers into shade and remove any heavy clothing. If they are alert and not vomiting, have them drink water slowly. They will probably need at least three quarts of water drunk over several hours. The water should be cool but not cold.

c. **Seek medical evaluation for heat casualties** even though mild signs and symptoms may be controlled by rest, shade and water. Give the highest priority for medical evacuation to soldiers who are incoherent or unconscious and hot; they may have heat stroke or some other serious illness.

d. Wet the skin or T-shirt and fan the casualty for cooling. If available, immersion in cool or iced water is the best way of reducing body temperature. A field expedient immersion

device can be built from tent canvas mounted in a frame off the ground. The water can then evaporate from the canvas and help to cool the bath. If an above-ground frame cannot be constructed, a shallow pit lined with canvas can be used.

e. Drink liquids that contain some added salt or electrolytes for heat cramps. If the victim can drink, give slowly, no more than 1.2 quarts (1.1 l) per hour using either salted water (one to two teaspoons or MRE packets of table salt per quart), the oral rehydration solution described in Appendix B, or commercial glucose/electrolyte beverages (sports-drinks).

#### **D. ENVIRONMENTAL POLLUTION**

Many areas in the Former Republic of Yugoslavia (FRY) are heavily polluted. The pollution includes air, water and soil contamination with a variety of industrial wastes and agricultural pesticides. These contaminants can effect the health of soldiers who are exposed to them.

##### **1. Problems with Pollution**

Air pollution in the FRY includes substances ranging from dust-like particles of coal and asbestos which can get trapped in the lungs, to acid-like compounds which irritate the eyes, nose and throat. High levels of air pollution decrease the amount of physical work a soldier can perform and can cause asthma in some soldiers. Asbestos can cause lung cancer many years after exposure, especially in soldiers who also smoke cigarettes.



Nearly half of the streams in the FRY are so polluted that they are unsafe for bathing, swimming or fishing. The pollution includes industrial compounds such as cadmium, lead and PBCs, and agricultural compounds such as pesticides and fertilizers. As described elsewhere in this manual, water may also be contaminated with infectious disease agents, making it doubly dangerous. Industrial and agricultural compounds can affect the brain, nervous system, liver and kidneys, and may cause cancer years after exposure.

Like water, soil in the FRY may be contaminated with industrial waste and agricultural compounds. There is evidence that radioactive wastes may have been abandoned in some garbage dumps. Soldiers can be exposed to contaminants by direct contact with soil or breathing dust. Contaminated soil can also contaminate water in nearby streams, lakes and wells.

## **2. Countermeasures for Problems with Pollution**

- a. Minimize exposure to polluted air when possible. Soldiers should avoid urban areas with high pollution levels, or should remain indoors during the times of day when pollution from industry and vehicles is highest. These options are not always available to soldiers, because of operational concerns and mission requirements.
- b. Place masks or dampened handkerchiefs over the mouth and nose to provide some protection when soldiers cannot avoid exposure to heavy air pollution.
- c. Drink water only from approved U.S. military water points, which are properly treated and tested.

d. Do not bathe or swim in water that has not been tested and approved by the U.S. military.

e. Avoid eating fish caught in the FRY waters because they may be contaminated with compounds that are not destroyed by cooking.

f. Avoid digging in or lying on contaminated soil, if possible. Also avoid areas around industrial sites, agricultural areas, and garbage dumps where pollution may have occurred.

#### **OCCUPATIONAL AND OPERATIONAL HAZARDS**

Soldiers deployed in the Former Republic of Yugoslavia (FRY) are at risk for stress reactions. There is a high potential for frustration due to slow improvements in civil order and the indigenous people's quality of life in the FRY. Frustration and stress reactions are normal, expected behavior experienced by soldiers placed in unusual or catastrophic situations. Adverse reactions can be reduced by providing soldiers with accurate mission specific information, preparing them for cultural and situational differences, and preparing them for exposure to traumatic events.

#### **A. OPERATIONAL STRESS**

Soldiers need to mentally prepare for deployment. If they do not know details of their mission responsibilities, and the tactical situation, additional stress will occur.

### **1. Problems with Operational Stress**

Ambiguity concerning the nature of the mission and uncertainty about length of deployment are the most common sources of stress among soldiers. Soldiers may not be sure whether their mission is peace-making, peace-keeping or humanitarian assistance. Uncertainty may arise about the length of deployment since the situation in the FRY will not get better immediately. Restoration of functioning government services and civil order will take time. The fact that U.S. presence will not immediately improve the situation has the potential to be frustrating and demoralizing.

Military missions in the FRY include the potential for combat. Killing, even an armed enemy, can cause a soldier to feel guilty. However, after a soldier is involved in several of these incidents, he may not feel guilty, which can become a source of distress. Leaders should expect soldiers to react strongly to the death of unit members, especially if death is the result of sudden attacks, sniper fire, or friendly-fire incidents. Stress reactions to such situations may appear as confusion, withdrawal, or emotional exhaustion.

Witnessing brutality, especially against women and children, may be a significant source of stress to soldiers. Long-standing ethnic and religious differences have led to repeated instances of brutality, mass murder, hostage abuse and rape. Soldiers observing these atrocities may experience disorientation, intense rage and anger, may be less alert and slow to react.

Occasionally, soldiers experience a single critical traumatic event that produces a reaction so strong that it is repeatedly relived in memories, daydreams, nightmares, or flashbacks.

Soldiers who have experienced a critical incident may have difficulty sleeping, be hyperalert, startle easily, or try to avoid places, sights, smells and people associated with the incident. They may not be able to express emotions easily and may feel detached from other soldiers in the unit.

Leaders should be aware of other potential sources of stress. Stress may be caused by living or working in close quarters (aircraft, vehicles, tents, etc.). In addition, boredom during the deployment is often a problem. Deployment also interrupts daily routines, and places individuals in unfamiliar surroundings, which may cause difficulty for some soldiers.

Operational stresses are compounded for some soldiers when they deploy because they leave behind their non-unit emotional support system. Families and civilian social groups (such as church groups, athletic clubs, etc.) are no longer immediately available for support during periods of stress. Lack of emotional support can lead to withdrawal, belligerence, or other combat stress behavior.

After returning home, soldiers are often expected to return to duty quickly as though "nothing has changed." Until they talk to nondeployed personnel, soldiers may not recognize how much they have changed. Other soldiers (who did not deploy) may not understand how the deployed soldier feels upon returning. This can leave soldiers feeling isolated and alienated.

## **2. Countermeasures for Operational Stress**

a. **Educate soldiers.** Rumors are common before deployment. Accurate information should be provided to soldiers and their families so they have appropriate expectations and will be psychologically prepared. Transmission of information from the chain of command should be scheduled on a routine basis so that soldiers will learn to rely on official sources, rather than rumor. Information about mission background, the rules of engagement, the length of deployment, the culture of the host country and the warring factions, the disease threat, etc. will give soldiers a concrete focus for plans and actions.

b. **Continue training.** Training for current and future missions should not stop in country. Well-learned and practiced skills are less disrupted by stress. Realistic training builds confidence, improves cohesion and prevents boredom. Training can counteract the strong feelings which may erupt when soldiers are confronted with noncombatants who have been *abused by various warring factions*.

c. **Live as a team.** Soldiers should be encouraged to handle issues (lack of privacy, personality conflicts, alienation, etc.) early, openly and as a team. A simple self-check and buddy-check system can identify and reduce the incidence of stress and increase overall unit effectiveness.

d. **Maintain unit cohesion.** Cohesive, well-disciplined units have fewer severe stress reactions. Methods to improve teamwork and unit effectiveness will also prevent stress reactions. Soldiers should routinely debrief each other after an operation, and discuss what

they saw and how they felt. Soldiers who have strong emotional reactions to traumatic events should be kept with the unit and treated as soldiers, not as casualties.

e. **Manage contacts with the injured, dead, and dying.** Soldiers who are caring for seriously ill and wounded should have opportunities to take regular breaks away from the action. Soldiers who handle the dead should attempt to insulate themselves from the task by not looking at faces and not learning names or other personal information about the dead. Soldiers should put mental and physical barriers between themselves and the deceased and finish jobs quickly. Soldiers who say they cannot handle such duty should be excused whenever possible. Soldiers should work in pairs; experienced soldiers should be paired with inexperienced ones.

f. **Schedule recreation.** Maintaining physical fitness and engaging in recreational activities reduces stress. Recreational activities which include units of multinational forces will also serve to introduce soldiers to each other, prevent friction and reduce hostility.

g. **Deliver mail.** Leaders should ensure that the unit's system for distributing mail is quick, efficient and effective. In particular, pay vouchers should be distributed in a timely manner.

h. **Allow decompression time.** Upon redeployment to their home station, soldiers need time to relax and adjust to normal routines. Units should encourage soldiers to take leave.

## **B. SEPARATION STRESS**

### **1. Problems with Separation Stress**

Deployment is a time of anxiety for many families. The need to write wills, prepare powers of attorney, etc. and efforts to plan for potential disruptions during the deployment is a sobering experience. Families who know significant events, such as the birth of a child or the death of a parent, are imminent, have special needs. Separation due to deployment creates a more emotional family situation with greater needs for reassurance and confidence. Family members may express their fear by acting angry or resentful.

Unresolved domestic problems distract the soldier. Single soldiers, newlyweds and single parents need to make different adjustments to deployment than those who have had time to evolve stable unit relationships and adequate family support. Soldiers will be concerned about the adequacy of the resources available to their families during their absence. Women soldiers may feel additional pressure to defend their decision to leave their families and serve in the Army. Recent mothers may experience extended post-partum depression. Soldiers often will not be able to explain emotions caused by family-related stress. They may be irritable, nervous, inattentive and have difficulty sleeping.

Soldiers returning from stressful duty often expect their families and friends to be just like they were when the soldier left. Families and friends change as they adjust to the absence of the soldier. They may become more self-reliant or they may begin to depend on another family member or friend. Clothing fashions change and children grow, so even the personal

appearance of friends and family may be different. Consequently, some soldiers may feel confused and disoriented.

## **2. Countermeasures for Separation Stress**

a. **Make family members self-sufficient.** Insure that families have the information and skills they need to manage their own and the soldier's personal affairs. Discuss routine responsibilities and the handling of minor emergencies. Build confidence by practicing these skills before the soldier deploys. Soldiers must be patient and mature. Soldiers who normally find it difficult to express their care and concern should work to find simple ways to reassure family members.

b. **Contact family support groups.** Soldiers should introduce their family members to available support groups (parents of soldiers, spouses of both genders and children of all ages should be included). Leaders should insure that support group members understand the need to provide support to those who need it most, regardless of rank, shyness or distance from post.

c. **Keep families and friends informed.** Efficient and effective official lines of communication with the home-base rear detachment should be established promptly. Soldiers should be encouraged to write home. Unofficial communication, such as a unit newsletter written by deployed soldiers, can be effective in reducing rumors back home and families' fears about their loved ones' living and working conditions.



d. **Plan reunions.** Soldiers should discuss how they will talk with family members about what they have seen and felt, how family members may have changed while they have been apart and the likelihood that families will not understand what the soldiers have experienced. Units that establish relationships with relief workers or local nationals should plan ways to reestablish communication with those individuals after the return home.

e. **Maintain networks.** Family support groups should not dissolve when soldiers come home. They can be useful in helping families deal with reunion stress.

## **C. FATIGUE**

### **1. Problems Causing Fatigue**

**Jet lag.** Whenever soldiers are moved quickly from one part of the world to another, several days are required to adjust to new conditions. Upon arrival, body rhythms function as if they were still on home station time zones. Soldiers may have trouble sleeping when they would normally be awake, especially if several time zones have been crossed. Soldiers with jet lag may be sleepy during the day, have degraded mental performance and difficulty sleeping at night. Their biological clocks will gradually adjust in response to local sunrise and sunset; although the process of adjustment generally takes four to seven days if soldiers do not prepare in advance.

**Sleep loss.** Soldiers do more work and perform better when they are rested. Mental or cognitive performance is affected by sleep loss earlier than physical performance. Sleepy soldiers do not always think clearly, plan effectively or follow procedures correctly. A 25%

decline in effectiveness can be expected for every 24 hours without sleep. Performance on monotonous or repetitive tasks is degraded first. Symptoms of sleep loss include extreme sleepiness, lapses in attention, irritability, lack of initiative, susceptibility to accidents and decreased attention to self-care. All soldiers are affected by sleep loss, but leaders and command/control personnel who deal with many cognitive tasks and complex decision making are most vulnerable. Soldiers who are well rested are less susceptible to disease and heal more quickly.

Soldiers' perceived need for sleep will increase between the hours of 1430 to 1700 and again in a more pronounced way, from 0100 to 0500. If soldiers stay awake through the night, they will experience changes of decreased mood, attitudes and motivation from 0100 to 0500. The greatest deficits in attention, reasoning and mental performance are likely to occur during this time.

## **2. Countermeasures for Fatigue**

a. **Minimize jet lag.** Leaders should be alert to soldier sleep requirements before deployment. Soldiers, deploying from CONUS, should prevent jet lag caused by the shift to the destination time zone by changing work and sleep periods before deployment. If possible, duty hours should gradually be shifted to the destination time zone before deployment. Preferably a day or two before deployment, but definitely prior to boarding the aircraft, soldiers should set their watches to the destination time zone. Cabin lighting and meal service on the aircraft should be coordinated with the destination time zone; that is, a breakfast meal should be served to coincide with breakfast time in the destination time zone. As soon as they arrive in country, soldiers should begin working, eating and sleeping according to local time. They

should participate in moderate exercise in daylight, avoid daytime naps and begin sleep at the "normal bed time" for the local time. This will help their body circadian rhythms adjust to the new time zone.

b. **Manage work-rest schedules.** Once at their destination, soldiers should sleep under conditions that maximize the amount of rest they get. Sleep is improved by providing familiar surroundings, mild temperatures, darkness, quiet, space to lie down, a padded surface and sleeping areas separate from the work site.

For soldiers who will be assigned to work or fight at night (night fighters), several days to a week of operating at night and sleeping during the day are recommended to allow for circadian rhythm adjustments to new work schedules. The greatest disruption in night fighter performance is usually attributable to poor quality day-time sleep, which tends to be intermittent and restless. Command attention should be given to ensure night fighters have adequate time for day-time sleep and to provide the best possible conditions for restful sleep.

c. **Minimize sleep loss.** Six to eight hours of sleep in each 24 hr day are optimal. Reasonable levels of productivity can be maintained for two to four days with four to five hours sleep per night. Taking naps of one to two hours should be encouraged when safely possible. Even 10-to 15-minute "power naps" are often helpful.

Sleep discipline SOPs should include provisions for recovery from sleep loss. Twelve hours of rest (including at least 8 hours of sleep) are needed after 36-48 hours of being continuously awake. Two to three days of rest or light duty (including at least 8-10 hours sleep

per day) are required to restore optimum performance after 72-96 hours of being continuously awake.

#### **D. ACCIDENTS AND NON-BATTLE INJURIES**

##### **1. Problems with Accidents and Non-Battle Injuries**

Casualties that are not inflicted by combat will have a significant impact on military operations. Accidents and non-battle injuries have historically resulted in many disabilities and fatalities. These occur with such frequency that they can reduce unit readiness, degrade effectiveness and disrupt operations. Non-battle injuries must be considered in the planning and execution of all operations and actions should be taken to reduce the occurrence of accidents.

Previously identified factors contributing to serious injury during military operations include: abandonment of safety practices during the early phases of deployment, poor visibility and depth perception in certain kinds of terrain and weather conditions, poor roads and no traffic control, athletic injuries resulting from both physical training, recreation and sports, improper handling of weapons and ordnance (both U.S. and those left over from previous conflicts) and failure to wear proper eye protection against operational hazards (U.S. Army Safety Center, Ft. Rucker, AL). Fatigue caused by chronic sleep deprivation and high mission-related stress will compound many of these problems. Because motor vehicle crashes and aviation mishaps are the leading causes of non-combat fatalities and serious disabilities, special care should be taken to prevent these types of accidents.

**2. Countermeasures to Avoid Accidents and Non-Battle Injuries.** Emphasize safety to preserve unit readiness and efficiency.

- a. Plan missions and work with safety in mind.
- b. Train personnel in proper use of equipment.
- c. Establish system to identify potential hazards and breakdowns in safety procedures.
- d. Follow established safety standards and procedures.
- e. Designate safety personnel.
- f. Emphasize vehicle safety (safety belts, speed limits).
- g. Avoid physical overtraining and minimize aggressiveness in sports.
- h. Enforce weapon safety procedures.
- i. Enforce ordnance handling, disposal policies.
- j. Make eye protection available and ensure proper use.
- k. Get adequate rest and sleep.

I. Manage individual and unit stress proactively.

**Drive Defensively**

Buckle seat belts.

Use extra care when operating vehicles on unimproved roads.

Do not drive too fast for conditions.

Check brakes before operating vehicles.

**NUTRITION**

Think of nutrition as an enhancement to military operations. Properly planned and executed good-feeding practices in the field maintain and enhance physical performance and morale and significantly contribute to mission accomplishment. Military leaders must ensure that soldiers know the importance of food and water and how to implement sound nutritional practices in the field (USARIEM Technical Note 93-3, see References). More importantly, leaders should set the example for troops by practicing "fit to win" eating habits themselves.

Unit leaders should watch to see what their personnel are eating or failing to eat. Military rations are designed to provide balanced nutrition when consumed in their entirety. Do not assume that a meal issued is a meal fully consumed. Commanders should control the use of

"pogey-bait" and non-issue food. Over consumption of non-issue food items often prevents soldiers from eating adequate military rations which ensure balanced nutrition.

Meals affect motivation and morale. Food intake is almost always higher at scheduled meals compared to unplanned meals. Soldiers tend to eat more when they are in a social group for meals. Hot meals will improve morale and increase food intake. If possible, try to schedule at least one hot meal per day. Leaders should try to establish regularly scheduled meal times, even when MREs are the only food.

## APPENDIX A

### Average Temperature & Humidity in the Former Republic of Yugoslavia

Numbers indicate for a given month in a given city, the average daily high (H) temperature (F°), the average low (L) temperature (F°), and the average relative humidity (R) expressed as a percent.

Month	Belgrade Yugoslavia (H/L/R)	Sarajevo Bosnia (H/L/R)	Split Croatia (H/L/R)	Zagreb Croatia (H/L/R)
Jan	37/27/80	37/25/80	50/41/62	37/28/80
Feb	41/28/75	41/27/74	52/41/61	43/30/74
Mar	52/36/67	50/32/70	57/45/60	52/37/67
Apr	64/45/61	59/41/66	64/52/60	63/46/63
May	73/54/62	68/46/67	73/61/60	70/54/66
Jun	79/59/63	75/54/66	81/66/55	77/59/66
Jul	82/63/59	79/55/64	86/72/50	81/63/65
Aug	82/63/60	81/55/61	86/72/50	81/61/66
Sep	75/55/62	73/50/67	79/66/57	72/55/71
Oct	64/46/70	61/43/74	68/57/63	59/46/78
Nov	52/39/78	50/37/78	59/50/67	48/39/82
Dec	41/32/81	43/30/80	54/45/67	41/32/83



**APPENDIX B**  
**Fluid Replacement Recipes for Dehydration**  
**Induced Either by Illness (Vomiting and/or Diarrhea) or by Sweat Loss**

**Garrison Recipe**

One cup (8 ounces) of fruit juice (orange or apple) with one half teaspoon of sugar or honey and a pinch of salt, followed by one cup of water with a quarter teaspoon of baking soda added. Drink this combination until thirst is quenched.

**Field Expedient Recipes**

a) Rehydration fluid replacement: Add to a 1 quart canteen of water: 1 MRE table salt packet (4.0 grams of NaCl) and 1 MRE packet of beverage base powder (28 grams of sugar).

b) Potassium replacement: After prolonged vomiting and diarrhea have occurred, potassium (KCl) replacements may be beneficial. The MRE cocoa beverage powder is a good source of potassium. Add to a 1 quart canteen of water: 2 MRE cocoa beverage packets (60 grams of sugar, 1.7 grams of KCl equivalent).

**Medic Recipe (Prepared by Medical Personnel)**

Add to 1 liter (1 quart) of water 3.5 grams table salt (NaCl), 2.5 grams baking soda ( $\text{NaHCO}_3$ ), 1.5 grams potassium chloride salt (KCl), and 20.0 grams sugar (glucose) and drink as needed for rehydration.

**Note:** 5 grams equals 1 teaspoon.

**APPENDIX C. Wind Chill Chart** (see instructions for use on page 58)

WIND SPEED (IN MPH)	ACTUAL TEMPERATURE (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°F)											
CALM	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	3	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	15	0	-15	-29	-44	-59	-74	-89	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-22	-37	-53	-69	-85	-101	-117	-132	-148
(WIND SPEEDS GREATER THAN 40 MPH HAVE LITTLE ADDITIONAL EFFECT)	LITTLE DANGER			INCREASING DANGER				GREAT DANGER				
	(In less than 5 hrs with dry skin. Greatest hazard from false sense of security.)			(Exposed flesh may freeze within 1 minute.)				(Exposed flesh may freeze within 30 seconds.)				

#### Instruction for Use of the Windchill Chart

To determine the windchill temperature enter the chart at the row corresponding to the windspeed and read right until reaching the column corresponding to the actual air temperature. For example, if the wind speed is 15 MPH and the actual temperature is 20°F, the equivalent windchill temperature would be -5°F. See Appendix D for precautions to be observed at this temperature.

## APPENDIX D. Cold-Weather Operational Guidelines

### Windchill Category

(see Windchill table)

#### Work Intensity

#### Little Danger

#### Increased Danger

#### Great Danger

<b>High</b> Digging foxhole, running, marching with rucksack, making or breaking bivouac	Increased surveillance by small unit leaders; Black gloves optional; mandatory below 0 °F; Increased hydration.	ECWCS or equivalent; Mittens with liners; No facial camouflage; Exposed skin covered and kept dry; Rest in warm, sheltered area; Vapor barrier boots below 0 °F.	Postpone non-essential activity; Essential tasks only with <15 minute exposure; Work groups of no less than 2; Cover all exposed skin.
<b>Low</b> Walking, marching without rucksack, drill and ceremony	Increased surveillance; Cover exposed flesh when possible; Mittens with liner and no facial camouflage below 10 °F; Full head cover below 0 °F. Keep skin dry - especially around nose and mouth.	Restrict Non-essential activity; 30-40 minute work cycles with frequent supervisory surveillance for essential tasks. See above.	Cancel Outdoor Activity if possible.
<b>Sedentary</b> Sentry duty, eating, resting, sleeping, clerical work	See above; Full head cover and no facial camouflage below 10 °F; Cold-weather boots (VB) below 0 °F; Shorten duty cycles; Provide warming facilities.	Postpone non-essential activity; 15-20 minute work cycles for essential tasks; Work groups of no less than 2 personnel; No exposed skin.	Cancel Outdoor Activity if possible.

These guidelines are generalized for worldwide use. Commanders of units with extensive extreme cold-weather training and specialized equipment may opt to use less conservative guidelines.

#### General Guidance for Cold-Weather Operations

<b>Skin:</b>	Exposed skin is more likely to develop frostbite. Covering skin lessens risk, provided that skin is kept dry. Avoid wet skin (common around the nose and mouth). Inspect hands, feet, face and ears frequently for signs of frostbite.
<b>Clothing</b>	Soldiers must change into dry clothing at least daily and whenever clothing becomes wet, and must wash and dry feet and put on dry socks at least twice daily.
<b>Nutrition:</b>	4500 calories/day/soldier. Equivalent to 1 ration-cold weather (RCW) or 4 MREs.
<b>Hydration:</b>	3-6 Liters (canteens)/day/soldier. Warm, sweet, non-caffeinated drinks preferable.
<b>Camouflage</b>	Prevents detection of cold injuries. Not recommended below 10 °F.
<b>Responsibilities:</b>	Soldiers are responsible for preventing individual cold injuries. Unit NCOs are responsible for health and safety of their troops. Cold injury prevention is a command responsibility.

## APPENDIX E

### Tips for measurement of Wet Bulb Globe Temperatures (WBGT).

1. WBGT measurements must be made at a point 4 ft. above ground level.
2. If the WBGT Kit (NSN 6665-01-109-3246) is used, care must be taken to ensure that the natural wet bulb is clean, as well as wet. Sand and grit can affect the measurements made with this instrument, be sure to clean and wash it regularly.
3. If the Wet Globe Temperature (WGT) Kit (i.e., "Botsball", NSN 6665-01-103-8547) is used, a correction procedure is required (Ref. message SGPS-PSP, 23 May 1990):

*WBGT = 0.8 X WGT + 0.2 X Dry Bulb where Dry Bulb may be measured by removing the dial thermometer from the WGT Botsball and reading the air temperature after three minutes (shading the sensor from direct sunlight).*

**Table F-1: Work Intensities of Military Tasks**

<u>PHYSICAL WORK INTENSITY</u>	<u>ACTIVITY</u>
<b>VERY LIGHT</b>	Lying On Ground Standing In Foxhole Sitting In Truck Guard Duty Driving Truck
<b>LIGHT</b>	Cleaning Rifle Walking Hard Surface/ 1 m/s No load Walking Hard Surface/ 1 m/s 20 kg load Manual Of Arms Walking Hard Surface/ 1 m/s 30 kg load
<b>MODERATE</b>	Walking Loose Sand/ 1 m/s No load Walking Hard Surface/ 1.56 m/s No load Calisthenics Walking Hard Surface/ 1.56 m/s 20 kg load Scouting Patrol Pick And Shovel Crawling Full Pack Foxhole Digging Field Assaults
<b>HEAVY</b>	Walking Hard Surface/ 1.56 m/s 30 kg load Walking Hard Surface/ 2.0 m/s No load Emplacement Digging

**Table F-2**  
**Number of Minutes of Work per Hour in Sustained Work-Rest Cycle**

WBGT	T <sub>a</sub>	RH	BDU				BDU + Flak Vest				Aircrew Flight Suit			
			VL	L	M	H	VL	L	M	H	VL	L	M	H
75	75	75	NL	NL	NL	29	NL	NL	NL	28	NL	NL	NL	31
80	80	75	NL	NL	NL	25	NL	NL	39	24	NL	NL	NL	27
84	85	75	NL	NL	31	20	NL	NL	30	19	NL	NL	35	22
89	90	75	NL	NL	21	14	NL	NL	21	13	NL	NL	24	16
88	95	50	NL	NL	26	18	NL	NL	26	17	NL	NL	29	19

**KEY TO TABLE**

WBGT - Wet Bulb Globe Temperature (°F)  
T<sub>a</sub> - Ambient Temperature (dry bulb - °F)  
VL - Very Light Work Intensity  
L - Light Work Intensity  
M - Moderate Work Intensity  
H - Heavy Work Intensity  
BDU - Battle Dress Uniform  
NL - No Limit (continuous work possible)

**INSTRUCTIONS & NOTES**

This table provides for four levels of work intensity (see table F-1), the number of minutes work per hour in work rest schedules tailored to the conditions specified. Spend the remainder of the hour in rest. This table was prepared using the prediction capability of the USARIEM Heat Strain Model. Assumptions used in generating this table include: 1) Soldiers fully hydrated, rested and acclimatized; 2) Wind-speed = 5 miles/hr; 3) Clear skies (full solar load); 4) Heat casualties < 5%. This guidance should not be used as a substitute for common sense or experience. Individual requirements may vary greatly. Appearance of heat casualties is evidence that the selected work-rest cycle is inappropriate for the conditions.

**Table F-3**  
**Water Requirements to Support Sustained Work-Rest Cycles [Qts/Hr]**

WBGT	T <sub>a</sub>	RH	BDU				BDU + Flak Vest				Aircrew Flight Suit			
			VL	L	M	H	VL	L	M	H	VL	L	M	H
75	75	75	0.3	0.6	1.0	0.8	0.4	0.6	1.1	0.8	0.3	0.5	1.0	0.8
80	80	75	0.5	0.7	1.2	0.9	0.5	0.8	0.9	0.9	0.4	0.7	1.1	0.9
84	85	75	0.6	0.9	1.0	1.0	0.6	0.9	1.0	0.9	0.6	0.9	1.0	0.9
89	90	75	0.8	1.1	1.0	1.0	0.8	1.2	1.0	1.0	0.8	1.1	1.0	1.0
88	95	50	0.8	1.1	1.1	1.1	0.8	1.1	1.1	1.1	0.8	1.1	1.1	1.1

**KEY TO TABLE**

WBGT - Wet Bulb Globe Temperature (°F)  
T<sub>a</sub> - Ambient Temperature (dry bulb - °F)  
VL - Very Light Work Intensity  
L - Light Work Intensity  
M - Moderate Work Intensity  
H - Heavy Work Intensity  
BDU - Battle Dress Uniform  
Qts/Hr - Quarts of Water per Hour

**INSTRUCTIONS & NOTES**

Amounts listed are required to support work/rest schedules in Table F-2; drinking should be divided over the course of each hour. Use Table F-5 to determine water required to support maximum continuous work times shown in Table F-4. This guidance was prepared using the USARIEM Heat Strain Model; assumptions used in generating this table include: 1) Soldiers fully hydrated, rested and acclimatized; 2) Windspeed = 5 miles/hr; 3) Clear skies (full solar load); 4) Heat casualties < 5%. This guidance should not be used as a substitute for common sense or experience. Individual requirements may vary greatly. Appearance of heat casualties is evidence that the selected work-rest cycle is inappropriate for the conditions.



**Table F-4**  
**Maximum Continuous Work Times [Minutes]**

WBGT	T <sub>a</sub>	RH	BDU				BDU + Flak Vest				Aircrew Flight Suit			
			VL	L	M	H	VL	L	M	H	VL	L	M	H
75	75	75	NL	NL	NL	77	NL	NL	NL	74	NL	NL	NL	87
80	80	75	NL	NL	NL	65	NL	NL	NL	63	NL	NL	NL	74
84	85	75	NL	NL	104	54	NL	NL	99	53	NL	NL	139	60
89	90	75	NL	NL	70	44	NL	NL	69	43	NL	NL	80	48
88	95	50	NL	NL	86	50	NL	NL	84	49	NL	NL	102	55

**KEY TO TABLE**

WBGT - Wet Bulb Globe Temperature (°F)  
T<sub>a</sub> - Ambient Temperature (dry bulb - °F)  
VL - Very Light Work Intensity  
L - Light Work Intensity  
M - Moderate Work Intensity  
H - Heavy Work Intensity  
BDU - Battle Dress Uniform  
NL - No Limit (Continuous Work Possible)

**INSTRUCTIONS & NOTES**

This table provides for four levels of work intensity (see Table F-1), the maximum number of minutes work that can be sustained in a single work period without exceeding a greater than 5% risk of heat casualties. This table was prepared using the prediction capability of the USARIEM Heat Strain Model. Assumptions used in generating this table include: 1) Soldiers fully hydrated, rested and acclimatized; 2) Windspeed = 5 miles/hr; 3) Clear skies; 4) Heat casualties < 5%. The guidance should not be used as a substitute for common sense or experience. Individual requirements may vary greatly. The appearance of heat casualties is evidence that the safe limits of work time have been reached.

**Table F-5**  
**Water Requirements for Maximum Continuous Work [Qts/Hr.]**

WBG	T <sub>a</sub>	RH	BDU				BDU with Flak Vest				Aircrew Flight Suit			
			VL	L	M	H	VL	L	M	H	VL	L	M	H
75	75	75	0.3	0.6	1.0	1.5*	0.4	0.6	1.1	1.5*	0.3	0.5	1.0	1.3*
80	80	75	0.5	0.7	1.2	1.7*	0.5	0.8	1.3*	1.7*	0.4	0.7	1.1	1.5*
84	85	75	0.6	0.9	1.4*	1.9*	0.6	0.9	1.5*	1.9*	0.6	0.9	1.3*	1.8*
89	90	75	0.8	1.1	1.7*	2.0*	0.8	1.2	1.7*	2.0*	0.8	1.1	1.6*	2.0*
88	95	50	0.8	1.1	1.6*	2.0*	0.8	1.1	1.6*	2.0*	0.8	1.1	1.5*	2.0*

\*Water requirement exceed probable maximum water absorption, see Instruction Notes.

**KEY TO TABLE**

WBG - Wet Bulb Globe Temperature (°F)  
T<sub>a</sub> - Ambient Temperature (dry bulb - °F)  
VL - Very Light Work Intensity  
L - Light Work Intensity  
M - Moderate Work Intensity  
H - Heavy Work Intensity  
BDU - Battle Dress Uniform  
Qts/Hr - Quarts of Water per Hour

**INSTRUCTIONS & NOTES**

Amounts listed are required to support continuous work times in Table F-4; drinking should be divided over course of each hour. If water requirement is above 1.2 liters, sweat loss is greater than maximum water absorption during an hour, and soldiers will become increasingly dehydrated regardless of amount drunk; leaders should plan for an extended rest and rehydration period at work completion. The table was prepared using prediction capability of the USARIEM Heat Strain Model; assumptions used in generating estimates include: 1) Soldiers fully hydrated, rested & acclimatized; 2) Windspeed= 5 miles/hr; 3) Clear skies; 4) Casualties < 5%. This guidance is not a substitute for common sense or experience; appearance of heat casualties is evidence that safe work limits casualties) have been exceeded.

### References

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